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**Center Office:** IRIS Center, 2105 Morrill Hall, College Park, MD 20742  
Telephone (301) 405-3110 • Fax (301) 405-3020

## **Capital Markets and Industrial Development: A Comparative Study of Brazil, India, Mexico, and the United States, 1840-1930**

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**Stephen Haber**

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Author: Stephen Haber, Department of History, Stanford University, Stanford, CA.

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**Capital Markets and Industrial Development: Comparative Study of Brazil, India, Mexico, and the United States. 1830-1940**

Stephen Haber  
Department of History  
Stanford University  
Stanford, CA 94305

This paper seeks to understand the conditions under which imperfections in capital markets may persist for long periods of time and the long-run efficiency consequences of those imperfections. It therefore examines the institutional history of textile mill financing in four countries, two of which had highly imperfect capital markets (India and Mexico), one of which had a relatively efficient capital market (the United States), and one of which made the transition from small, segmented, and concentrated capital markets to one which was characterized by a high degree of openness and efficiency by LDC standards (Brazil).

In order to understand the efficiency consequences of capital market imperfections the paper develops four firm concentration ratios and Herfindahl indices of the cotton textile manufacture in all four countries. I focus on textiles because it was the largest, **most important industry** in the three LDCs under examination and because textiles should be characterized by near perfect competition. High levels of industrial concentration in the cotton textile industry would indicate the presence of a barrier to entry. Since there were no technological or legal barriers to entry into the industry, high levels of concentration would point to financial barriers to entry.

The results indicate the following. First, the structure of a country's textile industry is not, surprisingly, a function of the size of its industry. In fact, the Indian textile industry was three times the size of Brazil's but was more highly concentrated. In the case of Mexico, concentration actually rose as the size of the industry increased.

Second, imperfections in capital markets gave rise to these imperfections in product markets. The cotton textile industries of Mexico and India were **highly concentrated** because **only a few** entrepreneurs were able to make use of the country's securities markets.

Third, differential access to capital in Mexico and India can be traced to two sources. The first were constraints on the formation of banks. In the case of Mexico, there were legal barriers to entry in banking. In the case of India, the formal banking system that could be used by the Indian textile industry was **small because the** large, British banks would not lend to domestic industrialists. The result was that most short-term capital was mobilized through

informal networks of wealthy Bombay merchants. In both cases, however, only some entrepreneurs were able to obtain short term finance. In Mexico, insider lending was the rule. Thus, only those **entrepreneurs with interests in the large banks could easily obtain** working capital. In India, only those entrepreneurs with well established reputations could obtain working capital. The end result was the same in both countries: only those entrepreneurs who were able to mobilize working capital through informal networks or the banking system were capable of mobilizing long term equity capital through formal securities markets. Thus, in both Mexico and India, small groups of financial capitalists dominated the textile industry.

The implications of the paper are the following. First, imperfections in capital markets may be caused both by government regulatory policies and by the high costs of obtaining information and monitoring borrowers. In the case of India, for example, the high costs of monitoring mill owners and managers meant that only those entrepreneurs with already established reputations could easily raise short term working capital or long term equity capital. Second, imperfections in capital markets may give rise to imperfections in product markets. In both Mexico and India, high levels of industrial concentration resulted from differential access to capital. Third, overcoming capital market imperfections requires that governments use their regulatory powers to lower the costs of obtaining information. Indeed, one of the keys to Brazil's **relative success in creating large and unconcentrated securities** markets was that the Brazilian government required firms to publish corporate financial statements twice each year along with lists enumerating the names and number of shares owned by each stockholder in any publicly traded firm.

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Stephen Haber  
Department of History  
Stanford University

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Michael Postan, the economic historian of the middle ages, once remarked that the entire English industrial revolution of the **eighteenth and early nineteenth centuries could have been financed** single-handedly by any one of Europe's medieval millionaires. The problem of finance during the early stages of industrialization, as **Postan** correctly pointed out, was not one of the accumulation of capital so much as the mobilization of capital--moving capital from the people who had (and often hoarded) it to those who needed to borrow it for industrial investment.

The problem posed by **Postan**--the effect of capital immobilities on industrial development--has received considerable attention from economic historians. The seminal work by Lance Davis on the United States and England and by Alexander Gerschenkron on **European** follower countries sparked the development of a mature literature on the relationship between the development **of institutional sources of finance and the development of** industry. Three themes emerge from that literature. First, government regulatory policies and the legal tradition played a critical role in the evolution of capital markets. Second, the development of capital markets became increasingly crucial the later a country embarked **on** the Process of industrialization. Third, the organization of financial institutions and financial markets strongly influenced the geographic location and productive organization of industry.<sup>1</sup>

Surprisingly, almost all of the empirical research to date has

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1. Interest among economic historians began with the seminal articles by Lance Davis and Alexander Gerschenkron in the 1960s. See Davis, "Capital Markets"; Davis, "Capital **Immobilities**"; and Gerschenkron, Economic Backwardness, chap. 1.

focused on countries that had, by world standards, fairly well developed capital markets. Little work has been done on the **relationship between capital market integration and the degree of** industry concentration in economies with truly imperfect capital markets, such as are found in Latin America or Asia. Moreover, because of the absence of data, the studies on developed economies have not developed cross-national estimates of industrial concentration that would **allow researchers to measure** systematically the impact of access to institutional sources of capital on the structure of industry. Researchers have largely relied on qualitative information or on data from the very recent **past (almost all of it of post-1950 vintage) to make cross-national** comparisons.<sup>2</sup> These features of the available data (its recent vintage and its focus on economies with well developed capital markets) have made the testing of hypotheses about the long term **relationship between the maturation of capital markets and the** growth and structure of industry problematic, if not impossible.

**This paper proposes to move beyond the literature on the economies of Western Europe and the United States through an** historical analysis of the impact of access to impersonal sources of capital on the development of **the cotton textile manufacture** during the early stages of industrialization (1840-1940) in three less developed economies with different histories of financial market regulation: Brazil, India, and Mexico. **It contrasts their** experience with that of the United States during a similar period

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<sup>2</sup>. See, for example, Davis, "Capital Markets," p. 271; Pryor, "An International Comparison," p. 136; Adelman, "Monopoly and Concentration," p. 19; Bain, International Differences: Attack, Firm Size and Industrial Structure," p. 465.

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in its industrial development.

I focus on the cotton textile industry for two reasons.

**First, the cotton goods manufacture was the most important** industry in the underdeveloped economies under study. It surpassed all other industries in terms of capital invested, size of the work force, or percentage of value-added it contributed to total industrial

**output**<sup>2</sup> Second, there are compelling theoretical reasons to focus on cotton textiles. In underdeveloped economies numerous factors, such as large economies of scale or technological barriers to entry, can condition the development of many industries.

Separating the effects of access to impersonal sources of capital from among these other factors is difficult across the entire industrial sector. In the cotton textile industry, however, these other factors did not come into play: the capital equipment was easily divisible, the minimum efficient scale of production was **small, and non-financial barriers to entry were largely absent.**

The only important barrier to entry was access to finance. The textile industry therefore provides an excellent test case of the relationship between the development of the financial markets that provide capital to an industry, and the development of the industry **itself.**<sup>4</sup>

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<sup>3</sup>. As Kuznets pointed out, textiles tend to be the first manufacturing industry to develop as economies modernize. The countries under study here therefore conform to this general **pattern.** See : Kuznets, Economic Growth of Nations, pp. 111-113.

<sup>4</sup>: This does not mean that scale economies were insignificant in cotton textile production. Indeed, had economies of scale been negligible, access to capital could not have served as a barrier to entry. **It does mean, however, that scale** economies were exhausted in textiles at relatively small firm sizes compared to such industries as steel, cement, and chemicals. Work in progress focuses on measuring scale economies and minimum efficient scales of production in the Brazilian and Mexican contexts.

The cases selected for study were chosen in order to test the hypotheses that the regulatory environment has a profound effect on the structure and size of financial markets, and that the structure and size of financial markets has a significant effect on the size and structure. I therefore searched for cases which had notably different histories of financial market regulation.

The United States was chosen because it is the touchstone case: it was an international leader in financial market development and industrial growth during the period under study.<sup>5</sup> Brazil and Mexico were chosen because they were the most industrialized countries in Latin America. More importantly, these two cases provide a counterfactual test of the hypotheses central to this study. Throughout the nineteenth century, Brazil and Mexico both followed highly repressive regulatory policies. In 1889, however, Brazil drastically changed its financial market regulations to a liberal, relatively non-repressive environment, while Mexico held on to its old repressive policies. Moreover, the costs of obtaining information were lowered in Brazil because its financial market regulations required all publicly held joint stock companies to publish balance sheets and lists of shareholders two times each year. Brazil thus provides a relevant test for understanding the opportunity lost by Mexico when it failed to

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<sup>5</sup>. This is not to suggest that problems of capital mobilization did not exist in the United States. The market for industrial securities was regional in nature until the late nineteenth century. Similarly, banks tended not to make loans outside their region. It is to suggest, however, that capital mobilization problems were significantly less severe in the United States than in the underdeveloped world and that the regulation of financial markets was far less repressive in the U.S. case than in the underdeveloped world.



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enact less repressive policies and failed to lower the costs of obtaining information. India was chosen because, like Brazil and Mexico,' it industrialized late and developed a large cotton textile industry. The Indian case also makes clear the point that a well developed capital market entails more than just the existence of a formal securities exchange: the high costs of obtaining information can give rise to market imperfections.

The **argument advanced** runs in the following terms. The **size** and structure of capital markets played a crucial role in determining the size and structure of the textile industry. In countries where the banking system was small and concentrated, Mexico being the archetypal case, the distribution of bank loans among potential textile industrialists was narrow; banks could only monitor a limited number of borrowers. Differential access to bank capital, in turn, gave rise to differential access to equity **capital: entrepreneurs with the proven ability to obtain loans for** working capital had a significant advantage over their competitors when it came to selling equity in the securities markets. In short, a small group of powerful financiers was able to obtain all the capital they needed, while everyone else was starved for funds.

The results were two-fold. **First**, the textile industry was highly concentrated, because access to impersonal sources of capital served as a barrier to entry. Second, since the ability to mobilize capital from banks and the securities markets was a scarce talent, financial capitalists played an important role in the development of the cotton textile industry.

In countries where the institutional rules of the game created

larger and less concentrated capital markets, such as the United States or post-1889 Brazil, the distribution of funds among potential textile industrilists was broader. **Access to** institutional sources of finance did not, therefore, serve as a barrier to entry, which in turn meant that the textile industry in those countries tended to be relatively less concentrated. Moreover, in these cases, industry tended to become increasingly **less** concentrated over time. This was precisely the opposite outcome that obtained in countries where access to institutional sources of capital served as a barrier to entry. In the Mexican case, for example, differential access to capital created by the limited opening of the capital markets during the 1880s and 1890s actually gave rise to an increase in concentration.

The persistence of capital market imperfections in countries like Mexico, pre-1889 Brazil, India can basically be tied to two factors. The first was the high costs of information and monitoring. In the case of India, for example, the peculiar nature of mill promotion and management made it very difficult for investors to monitor managers. In Mexico, the lax enforcement of reporting requirements made it extraordinarily difficult to obtain information **about** the financial- state of firms. **Investors in both** countries therefore made investment decisions based on the personal reputations of promoters. This meant that individuals with established reputations had a significant advantage over other potential industrialists in raising capital..

The second factor in limiting the maturation of capital markets were repressive government regulatory policies. These

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included restrictions on the chartering of joint stock enterprises, complicated provisions for obtaining a bank charter, high minimum **capital requirements for banks, and restrictions on bank** operations. These repressive policies were enacted to favor small groups of politically well connected financial capitalists by giving their banks special rights and privileges. In return, their banks dedicated a significant part of their **portfolio's** to **government loans, providing a stable and secure source of state** finance. Countries like Mexico were able to erect these kinds of barriers to entry into banking because they had very different legal traditions than the United States. In fact, in the case of Mexico, the legal tradition was characterized by the official promotion of monopoly, legal decision by fiat, and the centralization of political **power**.<sup>6</sup>

The argument developed in this paper runs counter to the dominant view of how financial systems develop. According to that view, financial markets grow up more or less automatically in response to the **growth** in demand for financial services.<sup>7</sup> **The** argument advanced here holds that the historical development of financial intermediaries is not flexible or automatic. In underdeveloped economies the demand for finance may exceed the growth of institutions designed to mobilize capital for considerable periods of time. This may occur because of repressive

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6. These characteristics were exactly the opposite of those that prevailed in the United States, where the legal tradition of state's rights and a distrust **of monopoly** gave rise to a much more open banking structure. For a discussion of the U.S. case see: Smith and Sylla, **"The Transformation."**

7. For a more complete discussion see Patrick, **"Financial Development,"** p. 175.

financial market regulatory policies, because of poorly specified property rights, or because the costs of obtaining information may be high. Obviously, some capital market development is endogenous, but government policies and the legal tradition have strong independent effects.

The first section of this paper compares the institutional history of financial intermediaries and textile mill financing in the four countries over the period 1840 to 1930.<sup>8</sup> The second section then assesses changes in the size and structure of each country's textile industry in light of their histories of industrial finance.<sup>9</sup> It also develops a counter-factual model to estimate the loss to Mexico of its repressive financial market regulatory policies. The third section concludes.

## **I. Capital Markets and Textile Finance**

### **The United States**

Unlike the vast majority of American manufacturing companies of the nineteenth century, which were organized as sole proprietorships or partnerships, the large, vertically integrated cotton textile producers of New England were organized as publicly-held, joint stock corporations from their very beginnings in the 1820s. The market for these securities was rudimentary during most of the century; the shares of most companies were very closely

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<sup>8</sup>. For reasons of space, this discussion is brief. A book length work in progress by the author treats the cases in considerably more detail.

<sup>9</sup>: ~~Conc~~ Concentration is measured for both Brazil and Mexico by both the four-firm ratio and the Herfindahl Index. In the case of India, it has been possible to estimate Herfindahl indices for only 1900 and 1911; four firm ratios have been estimated for 1900, 1911, 1920, 1930. Work in progress will estimate Herfindahls for all four observations. In the U.S. case concentration is measured solely by the four-firm ratio.

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held, and their often high par values (frequently \$1,000) meant they could not be bought by the typical small investor. In addition, these companies appear to have been able to raise capital on a regional scale only; out-of-state shareholders were so scarce as to be virtually nonexistent. Yet these stocks were deemed of investment quality, and their holders knew that a market, however circumscribed, did exist for their sale. As early as 1835, 14 textile issues were traded on the Boston Stock Exchange. This grew to 32 by 1850 and to 40 in 1865. This was not yet a well-developed securities market, but it did provide for a wider distribution of ownership than more traditional forms of business organization would have. Indeed, one of the striking aspects of the large, Massachusetts-type companies was the pattern of widely dispersed ownership' of shares among individuals and institutions.<sup>10</sup>

Far more important than the sale of equity in the capitalization of the early textile mills was the ability of manufacturers, especially small and mid-sized ones, to obtain loans from banks and other institutions. This kind of institutional lending to manufacturers appears to have been confined to the northeast, which quickly developed a large banking system. As early as 1819 New England had 84 banks with a capital of \$16.5 million. By 1860 the region boasted 505 banks with \$123.6 million in capital.<sup>11</sup>

The large number of bank loans to textile manufacturers is not

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10. Davis, "Stock Ownership," pp. 207-14; Martin, A Century of Finance, pp. 126-31; and Navin and Sears, "Rise of a Market," p. 110.

11. Davis, "New England Textile Mills," pp. 2, 5; Davis, "Sources of Industrial Finance," p. 192; and Lamoreaux, "Banks, Kinship, and Economic Development," p. 651.

surprising when you consider that the owners of mills tended to be the same people that owned the banks. New England's banks, as Naomi Lamoreaux has shown, were not the independent credit intermediaries of economic theory.<sup>12</sup> Rather, they were the financial arms of kinship groups whose investments spread across a wide number of economic sectors and a wide number of enterprises. Basically, kinship groups tapped the local supply of investable funds by founding a bank and selling its equity to both individual and institutional investors. The founding kinship groups then lent those funds to the various enterprises under their control, including their own textile mills. Insider lending was the rule rather than the exception. Bank resources were therefore monopolized by the families that founded them, leaving little in the way of credit for applicants outside of the kinship group.

Had legal restrictions been placed on the founding of banks, these insider arrangements would have concentrated capital in the hands of a small number of kinship groups, which, in turn would have led to concentration in textile manufacturing. The fact that entry into banking was essentially free, however, meant that it was difficult to restrict entry into the textile industry by controlling access to capital. The U.S. system did not provide for a completely equal distribution of investable funds, but it did allow a large number of players to enter the game.

This regionally based capital market was gradually transformed into a national capital market in the second half of the century, thanks to the passage of the National Banking Act, which created a

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12. Lamoreaux, "Banks, Kinship, and Economic Development."

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network of nationally chartered banks, and the widespread sale of government bonds to the public. The practical effects of these **institutional developments were far-reaching, In the first place,** the number of banks mushroomed throughout the second half of the century. Second, because of a peculiarity of the Civil War banking laws prohibiting nationally chartered banks from making loans on the basis of real estate collateral, national banks in rural areas **Of the country deposited their funds in the reserve city and** central reserve city banks in urban areas. This not only directly increased the supply of funds for industrial loans, but also increased the supply of funds available for stock market speculation. Finally, the public's experience with canal company, railroad, and government securities slowly convinced small investors that paper securities were **"as** secure an investment as a house, a farm, or a **factory."**<sup>13</sup> By the end of World War I the textile industry was awash in finance and many companies took advantage of the swollen credit markets to float numerous securities **issues.**<sup>14</sup>

In short, it was not the case that all American textile industrialists had equal access to impersonal sources of capital. **Indeed, one of the primary reasons** that the textile industry concentrated for so long in New England was because of **inter-**regional capital immobilities. But relative to the underdeveloped countries discussed below, large numbers of U.S. industrialists

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<sup>13</sup>. Davis, "Capital Immobilities," p. 96; and Sylla, American Capital Market, pp. 12, 14, 26, 52, 209.

<sup>14</sup>. Temporary National Economic Committee, Investigation of Concentration, p. 255; and Kennedy, Profits and Losses, chaps. 2 and 10.

were able to tap into the capital markets quite early in the country's industrial history.

### Mexico

Mexico's experience stands in stark contrast to that of the United States. The expansion of the Mexican cotton textile industry, like that of the other **LDCs** discussed in this paper, occurred quite late in the nineteenth century. While Mexico began the transition to a mechanized textile industry as early as the **1830s**, it was not until the 1890s that the industry witness sustained growth. By this point, however, technological changes had raised the cost of entry into textile manufacturing. Thus, unlike U.S. textile manufacturers, who were able to finance a significant part of their expansion and modernization through an extended process of the reinvestment of profits, most Mexican textile firms had to purchase their equipment **all** at once, increasing the importance of impersonal sources of capital-

The institutions that could mobilize impersonal sources of capital, however, were very poorly developed in Mexico. Even after an expansion of the banking sector and the stock market in the 1880 and **1890s**, the vast majority of manufacturers were unable to utilize these avenues to mobilize capital.

Institutional lending to industry was largely absent in Mexico until the **1880s**. As late as 1884 there were only eight banks in operation, and as late as 1911 Mexico had but 47 banks, only **10** of which were legally able to lend for terms of more than a year.<sup>15</sup>

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<sup>15</sup>. By 1910 the United States had some 25,000 commercial banks alone. This does not include the thousands of trust companies, savings banks, and savings and loan associations.



The few banks able to make long-term loans existed primarily to finance urban and rural real estate transactions; in fact, they had **a great deal of difficulty generating their own capital.**<sup>16</sup>

Not only were there few banks, but the level of concentration within this small sector was very high. In 1895, three banks--the Banco **Nacional** de Mexico, the Banco de Londres y Mexico, and the Banco **Internacional** Hipotecario accounted for two-thirds of the capital invested in the banking system. The first two banks issued 80 percent of the bank notes in circulation. Even as late as 1910 the same two banks dominated the credit market, accounting for 75 percent of the deposits in Mexico's nine largest banks and roughly one-half of all bank notes in **circulation.**<sup>17</sup> If anything, the years after 1910 saw an increase in concentration, as the Mexican Revolution in that year threw capital markets into disarray, destroyed the public's faith in paper money, and put a brake on the **development of the banking sector until the late 1920s.**<sup>18</sup>

The result of Mexico's slow and unequal development of credit intermediaries was that most manufacturers could not obtain bank financing. Even those that could only succeeded in getting **short-term** loans to cover working capital costs. Thus, Mexico's largest bank, the Banco **Nacional** de Mexico provided credit to a number of large industrial establishments in which its directors had interests. These included five of the nation's largest cotton textile producers, its largest wool textile mill, and the two firms

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16. Marichal, "El nacimiento, p. 251; Sanchez Martinez, "El sistema monetario," pp. 60, 76-77; Haber, Industry and Underdevelopment, p. 65.

17: ~~Sanchez~~ Sanchez Martinez, "El sistema monetario," pp. 81-82; and "El Nacimiento," p. 258.

18. Cárdenas and Manns, 1989.

that held monopolies on the production of newsprint and explosives. But even these insider loans constituted a small part of the total **capital of those manufacturing firms**. An analysis of the balance sheets of three of the country's largest cotton textile producers during the period from 1907 to 1913 indicates debt-equity ratios averaging **.20:1.00**. Virtually all of this debt was short term, most of it consisting of trade credits provided by suppliers.<sup>19</sup>

Equity financing through the **creation of a publicly-held**, joint stock company was also unknown in the Mexican textile industry until the late **1880's**. Even after the first industrial companies appeared on the Mexico City stock exchange, however, the use of the exchange to raise equity capital remained limited. By 1908 only 14 industrials were traded on the exchange: no new **firms** joined their ranks until the late 1930s. Of those few industrial companies only four were cotton manufacturers. Thus, of Mexico's **100 cotton textile firms in 1912 (controlling 148 mills)**, only four percent represented publicly traded joint stock companies.<sup>20</sup>

The reason that capital markets were so late in developing in Mexico and then grew in such a limited way was largely owing to three factors. The first of these was the politicized nature of defending property rights and enforcing contracts. **Personal ties to** members of the government were essential for entrepreneurs to

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<sup>19</sup>. Sanchez Martinez, "**El sistema monetario**"; Haber, Industry and Underdevelopment, pp. 65-67.

<sup>20</sup>. The activity of the Mexico City stock exchange was followed by Mexico's major financial weeklies: La Semana Mercantil, 1894-1914; El Economista Mexicano, 1896-1914; Boletín Financiero y Minero, 1916-1938. The behavior of the shares of these firms is analyzed in Haber, Industry and Underdevelopment, chap. 7. The total number of firms is from textile manuscript censuses in **Archivo General de la Nación, Ramo de Trabajo, caja 5, legajo 4** (also see **caja 31, legajo 2**).

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obtain the rights to official monopolies, trade protection, government subsidies, or favorable judicial rulings. Indeed, it was almost impossible to do business without resorting to political machinations.<sup>21</sup> Thus, only well-established financiers with clear ties to the Diaz regime appear to have been successful in floating equity issues. The inclusion of important political actors on the boards of the major joint stock industrial companies (including the brother of the treasury secretary, the minister of war, the president of congress, the undersecretary of the treasury, and even the son of the president) suggests the importance of those ties to the investment community. Further cementing (and demonstrating) those ties was the fact that many of Mexico's most successful financial capitalists not only served on various government commissions and represented the government in international financial markets, but also organized rallies for Porfirio Díaz's (always successful) election campaigns.<sup>22</sup>

The second factor impeding the growth of capital markets was the loose enforcement of financial reporting requirements. In fact, publicly traded manufacturing companies often failed to publish balance sheets in public documents (such as the Diario Oficial or the financial press) in many years, even though the law required them to do so. The result was that individuals tended to invest only in those enterprises controlled by important financial capitalists. In this sense, Mexico's major financiers played the

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21. Coatsworth, "Obstacles," p. 98. For a discussion of the politicized nature of the legal system see Walker, Business, Kinship, chaps. 1, 4-5, 7-8.

22. For a discussion of the activities of these entrepreneurs see Haber, Industry and Underdevelopment, chaps. 5, 6.

same role as individuals like J.P. in the financing of U.S. heavy industry. Their presence on the boards of companies signalled the investment community that a particular enterprise **was** a safe bet.<sup>23</sup> Two characteristics of the Mexico City stock exchange are particularly striking in this regard. First, almost all of the publicly traded industrials had well known, politically well connected financial capitalists like Antonio **Basagoiti**, Hugo **Scherer**, or **León** Siynoret as directors. Second, there was very little entry and exit in the stock exchange. It was not the case that small firms tried to float issues and failed, or that small firms succeeded in selling equity and then went out of business. Rather, the pattern was for a few large firms to be capitalized through the sale of equity. These firms then dominated their respective product lines well into the 1920s and 1930s.<sup>24</sup>

The third factor slowing the development of impersonal sources of finance was Mexico's regulatory environment. Throughout the early and mid-nineteenth century, the lack of modern commercial and incorporation laws retarded the development of banks and joint stock companies. No body of mortgage credit laws was written until 1884, and it was not until 1889 that a general incorporation law was **established**. Thus, for most of the century it was extremely difficult to enforce loan contracts and establish **joint** stock companies.

Even when those laws were in place, however, new restrictive

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<sup>23</sup>. On the U.S. case see: Davis, "Capital Immobilities"; De Long, "Did J.P. Morgan's Men Add Value?"

<sup>24</sup>. Examples can be found in the steel, beer, soap, dynamite, cigarette, wool textile, and paper industries, in addition to cotton textiles. See Haber, Industry and Underdevelopment, chaps. 4, 5.

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banking regulations prevented the widespread development of credit institutions. The Mexican government favored the nation's largest bank, the **Banco Nacional de México**, with all kinds of special rights and privileges. These included reserve requirements that were half that demanded of other banks, the sole right to serve as the government's intermediary in all its financial transactions, a monopoly for its notes for the payment of taxes or other fees to the government, an exemption from taxes, and **the** sole right to establish branch banks. At the same time that the government created this privileged, semiofficial institution, it erected significant barriers to entry for competing banks, including extremely high minimum capital requirements (originally 500,000 pesos, later raised to **1,000,000**), high reserve requirements (banks were **required** to hold one-third the value of their bank notes in metallic currency in their vaults and an additional third in the **treasury**), **a prohibition on creating new banks without the** authorization of the secretary of the treasury **and** the Congress, a prohibition on foreign branch banks from issuing bank notes, a 5 percent tax on the issue of bank notes, and the restriction of bank notes to the region in which the bank **operated.**<sup>25</sup> Making the **situation even more problematic was the revision of these banking** laws every few years. The result was a legal environment that was not only restrictive but arbitrary as well.

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25. When the first minimum was established in 1897, it was equal to \$233,973 U.S. The increase in 1908 brought the minimum capital requirement up to \$497,265, roughly five times the minimum **for nationally chartered banks in the United States.** For a discussion of these various privileges and barriers to entry, as well as changes in banking laws, see Sanchez Martinez, "**El sistema**," pp. 43, 61-62, 67; Ludlow, "**La construccion**," pp. 334-36; Bdtiz V., "**Trayectoria de la banca**," pp. 286, 287, 293.

The motivation behind these restrictive banking policies was essentially twofold. First, the Mexican government was more concerned about establishing a secure, stable source of finance for itself than it was in creating large numbers of institutions designed to funnel credit to manufacturers. Second, the group of financiers that controlled the **Banco Nacional** de Mexico also happened to belong to the inner clique of the **Díaz** regime and had used their **political influence to obtain a special concession that** restricted market entry.

The tight regulation of banking had two important ramifications. The first was that the number of banks and the extent of their operations remained small: industrial companies could not therefore generally rely on them as a source of finance. The second was that the credit market could not serve as a source of finance for speculation on the stock exchange as it had in the United States (and as it would in Brazil). This served to further impede the growth of the Mexico City stock exchange.

One might think that foreign capital would have made up for the lack of a well developed Mexican capital market. After all, foreign investors were pumping billions of dollars into Mexican oil wells, mines, railroads, utilities, and export agriculture. There was in fact some foreign portfolio investment in Mexico's cotton textile industry, but the phenomenon was not widespread. The reason for this lack of foreign investment in textiles was that manufacturing enterprises sold their output domestically, and thus **earned their incomes in Mexican silver pesos.** Silver, unfortunately, lost 50 percent of its value against gold during the

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period 1890 to 1902, meaning that the rate of return in foreign, gold-backed currency, was halved once an investor converted his Mexican dividend payments back into sterling, dollars, or francs. In fact, the one foreign company that specialized in Mexican manufacturing investments, the **Société Financière pour l'industrie au Mexique** fared very poorly for precisely this reason. Its franc-denominated rates of return were embarrassingly low, and its annual reports read like an apologia to its shareholders for the depreciation of the Mexican peso.<sup>26</sup> It was largely for this reason that foreign investors tended to focus on enterprises in which income was earned in foreign, gold-backed currencies, like oil extraction, mining, and export agriculture, or where the Mexican government guaranteed a pre-established rate of return, like railroading.

In short, throughout its first 100 years of existence, the Mexican cotton textile industry had to rely on informal networks for its financing. When institutional innovations in the capital market created new opportunities for firms to obtain impersonal sources of finance, only a small group of entrepreneurs was able to benefit.

### Brazil

Until the last decade of the nineteenth century, Brazilian textile entrepreneurs faced a capital market similar to their Mexican counterparts. Beginning in the 1890's, however, Brazil's capital markets, prompted by government regulatory reforms,

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<sup>26</sup>. The annual reports of the **Société Financière pour l'industrie** au Mexique can be found in La Semana Mercantil, 8 Aug. 1903; El Economista Mexicano, 11 Oct. 1902, 6 July 1904, 4 Aug. 1904, 21 Oct. 1905, 18 Aug. 1906.

underwent a long process of expansion and maturation. The result was that impersonal sources of finance became widely available to Brazilian textile manufacturers.

Throughout most of the nineteenth century, institutions designed to mobilize impersonal sources of capital were largely absent in Brazil. An organized stock exchange had functioned in Rio de Janeiro since early in the century, but it was seldom used to finance industrial companies. During the period from 1850 to 1885 only one manufacturing company was listed on the exchange, and its shares traded hands in only 3 of those 36 years. Neither could Brazil's mill owners appeal to the banking system to provide them with capital. In fact, formal banks were so scarce as to be virtually nonexistent. As late as 1888 Brazil had but 26 banks, whose combined capital totaled only 145,000 cantos--roughly \$48 million U.S. Only 7 of the country's 20 states had any banks at all, and half of all deposits were held by a few banks in Rio de Janeiro.<sup>27</sup>

The slow development of these institutions can be traced in large part to public policies designed to restrict entry into banking. The imperial government, which held the right to charter banks, was primarily concerned with creating a small number of large super-banks that could serve as a source of government finance and that would prevent financial panics. The absence of banks not only restricted the amount of credit available to textile entrepreneurs, but it also meant that banks could not underwrite

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<sup>27</sup>. Topik, Political Economy, p. 28; Peláez and Suzigan, Historia monetaria, chaps. 2-5; Saes, 1986: 73; Levy, 1977: 109-12; Stein, 1958: 25-27.



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securities trading or finance securities' speculation, the way they did in the United States and Western Europe.<sup>28</sup> Finally, **restrictive policies discouraged the spread of the corporate form** of ownership: Founding a joint stock company required special government permission; investors were not allowed to purchase stocks on margin; and banks were restricted from investing in corporate **securities.**<sup>29</sup>

The last decade of the nineteenth century, however, witness a dramatic and sustained transformation of Brazil's capital markets. Driving this transformation were public policies deregulating the banking industry and securities markets. These policies had two goals: appease Brazil's slave owning classes for the loss of their slaves in 1888 by increasing the supply of credit; speed Brazil's transition from an agrarian economy run with slave labor to a modern industrial and commercial economy. As of 1889, legal **barriers to entry into banking were removed and** banks could engage in whatever kind of financial transactions they wished. Other reforms eased the formation of limited-liability joint stock companies and encouraged securities trading by permitting purchases on margin. Finally, new industrial ventures were exempted from taxes and customs duties.

Also of importance were financial reporting requirements that made managers more accountable to stockholders. Brazil's publicly traded corporations were required to produce financial statements twice a year and reprint them in public documents (such as the

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28. Sylla, 1975: 52, 209.

29. Levy, 1977: 117; Peláez and Suzigan, 1976: 78-83, 96-97; Saes, 1986: 22, 86.

Diario Official or the Jornal do Commercio). In addition, their biannual reports had to list the names of all stockholders and the numbers of shares they controlled. Investors could thus obtain reasonably good information on the health of firms and the identities of their major **shareholders**.<sup>30</sup>

For textile industrialists these reforms, which came to be known as the Encilhamento, produced dramatic **results**.<sup>31</sup> Over the short term, the Encilhamento created large numbers of banks, which both directly lent funds to manufacturers as well as financed stock market **speculation**.<sup>32</sup> The second and more important effect of the **Encilhamento was that it financed the creation of large numbers of joint stock manufacturing companies**. In 1888 only 3 cotton textile enterprises were listed on the Rio stock exchange; by 1894 there were 18, which grew to 25 in 1904 and to 57 in 1915, when it began to level off. Thus, in 1915, 57 of Brazil's 180 cotton textile companies (32 percent) were publicly traded, joint stock **limited-liability corporations**.<sup>33</sup> Recall that in Mexico only four percent of cotton textile firms took this organizational form.

The Encilhamento also created a market for publicly traded corporate debt. This bond market, like the stock exchange, was located in Rio de Janeiro and primarily benefitted Rio and Distrito

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30. Shareholder lists were not published in the abbreviated reports reprinted in the Jornal do Commercio or the Diario Official, but they were published in the original annual reports.

31. Topik, 1987: 28-31; Peláez and Sutigan, 1976: 143; Stein, 1957: 86.

32. Levy, 1977: 117, 245.

33. Calculated from: Centro' Industrial do Brasil, 1917; Levy, 1977: 245, 385. The peak number of publicly traded textile firms was reached in 1922, when 64 textile issues traded on the Rio exchange. By 1927 this had fallen to 52 firms, as the slow growth of the Brazilian economy in the early 1920s forced out weak firms.

Federal firms.<sup>34</sup> As early as 1905, 31 of Brazil's 98 textile firms (32%) were raising capital through the sale of debt. By 1915, 50 of the country's 180 firms (28%) reported bond debt in their census returns. In fact, a comparison of the 1905 and 1915 censuses indicates that new debt issues accounted for 29 percent of all new investment in the textile industry as a whole during that ten year period. For the large-scale, Rio de Janeiro and Distrito Federal firms, which were able to easily tap into the bond market, new debt issues accounted for a whopping 69 percent of all new investment from 1905 to 1915. Thus, from 1905 to 1915, the average debt-equity ratio grew from .16:1.00 to .27:1.00 for Brazilian cotton textile firms as a whole and from .14:1.00 to .43:1.00 for firms in the Federal District and Rio de Janeiro.<sup>35</sup> Recall that Mexico's large, publicly traded, vertically integrated firms had debt-equity ratio's roughly half that of their Rio and Distrito Federal counterparts, almost none of which was long term bond debt. In fact, if we were to include the types of trade credits from suppliers and other short term loans that made up the liabilities of Mexican firms (these are not enumerated in the Brazilian censuses), the differences between Brazil and Mexico would be even larger.

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<sup>34</sup>. During the period under study, Rio de Janeiro was Brazil's capital. The Distrito Federal (Federal District), comprised the area immediately around the city of Rio, much the way that the District of Columbia encloses the city of Washington. Surrounding the Distrito Federal was the state of Rio de Janeiro.

<sup>35</sup>. The averages reported are weighted by the size of each firm's total capital investment. These debt-equity ratios do not include short term bank debt or accounts payable, which would have raised the ratios even higher. The censuses did not report these other sources of debt. Estimates of new investment and its sources computed from Vasco, 1905; Centro Industrial, 1917; Centro Industrial 1927.

The development of the bond market appears to have been cut short by the First World War. Between 1915 and 1927, new debt issues accounted for only seven percent of new capital spending by Brazil's cotton textile firms. Even the Rio de Janeiro and Distrito Federal firms felt the pinch: only nine percent of net new investment there was accounted for by new bond issues. Thus, by 1927 debt-equity ratios were at roughly half their 1915 levels, falling to **.13:1** for all Brazilian firms and to **.22:1.00** for Rio de Janeiro and Distrito Federal firms. The most important source of new investment capital was retained earnings, which accounted for 48 percent of new additions to capital for all Brazilian firms and for 56 percent for Rio de Janeiro and Distrito Federal firms. The remainder of new capital spending was made up of new equity issues by already established companies and the founding of new firms, particularly in the state of Sao Paulo.<sup>36</sup>

These patterns are mirrored by a micro-level analysis of 15 Rio and D.F. firms that I have traced across the 1905, 1915 and 1927 censuses. This study of same-firm financing controls for the possible effects of the entry and exit of firms in the aggregate analysis. In these 15 large scale, publicly traded firms, new debt issues accounted for 63 percent of net new investment between 1905 and 1915. By 1915, 13 of the 15 firms had gone to the bond market (compared to seven of the 15 in 1905), producing an average debt-equity ratio of **.39:1.00**, up from **.15:1.00** in 1905. Between 1915 and 1927, however, only 12 percent of these firms' new additions to

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<sup>36</sup>. Calculated from Vasco, 1905; Centro Industrial, 1917; Centro Industrial, 1927. All averages are weighted by the value of capital.

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capital were financed by new bond debt. Most of their expansion (59 percent) was financed out of retained earnings, while new **equity issues** accounted for 29 percent **of new capital spending**. Thus, their average debt-equity ratio fell to **.23** in 1927, less than 60 percent of its 1915 **level**.<sup>37</sup>

This slowing in both the rate of growth of new stock and bond issues is most likely explained by the impact of the First World War. **In the first place**, the war set **off** a wave of inflation in Brazil. This would have discouraged investors from purchasing bonds, because securities with fixed rates of interest are extremely unattractive in an economy characterized by inflationary expectations. Second, the two main sources of growth of the pre-war Brazilian economy, foreign capital inflows and Brazilian primary product exports, were cut off by the onset of the conflict. Domestic demand for textiles, which was probably highly income **elastic, therefore fell, producing a decline in corporate** profitability. Though this proposition needs to be tested empirically, it is clearly the case that dividend payments to shareholders slowed substantially during the war, with some major firms failing to pay out profits at all, indicating that corporate

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37. Calculated from Vasco, 1905; Centro Industrial, 1917; Centro Industrial, 1927. All averages are weighted by the value of capital. Rio and Distrito Federal firms were chosen for study because the county's stock and bond markets were located there. The firms are the Companhia Petropolitana, Companhia **Magéense**, Companhia Fabril Sao Joaquim, Companhia Manufactora Fluminense, Companhia Corcovado, Companhia Brasil Industrial, Companhia **Confiança** Industrial, Companhia **Cometa**, Companhia Sao Pedro de Alcantara, Companhia Dona Izabel, Companhia **Alliança**, Companhia Progreso Industrial do Brasil, Companhia Industrial Campista, Companhia Nova **Fabrica** Santo Aleixo, and the Companhia America Fabril.

profits were **weak**.<sup>38</sup> The result would have been a dampening of the investment community's enthusiasm for new securities issues by the **textile industry during the war and immediately thereafter.**

In short, Brazilian textile industrialists were limited in their sources of finance throughout most of the nineteenth century. Beginning in the late **1880s**, however, regulatory reforms brought about important innovations in financial intermediation that made access to institutional sources of finance relatively easy for many entrepreneurs. Even though the development of these new sources of finance was slowed by the First World War, it still produced an extraordinarily large and well integrated capital market by the standards of developing economies at the time.

### India

Like Brazil and Mexico, institutional sources of industrial capital were largely non-existent in India until the second half of **the nineteenth century. Beginning in the 1860's, however, India's** capital markets began to open up and provide finance for the country's growing cotton textile industry. Even more than in Brazil, textile firms were financed through the sale of equity to the public. Like Mexico, however, significant imperfections **existed** in the Indian capital market that gave capitalists with reputations as well-established financiers considerable advantages over their competitors.

The major impediment in pre-1860 India appears to have been

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38. I am currently constructing estimates of the rate of return on capital for a sample of 15 large, publicly traded textile manufacturers covering the period 1890 to 1938 to test this proposition.

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restrictions on the formation of limited liability joint stock companies. As of 1857, however, reforms were carried through **permitting enterprises to be founded on the basis \*of limited** liability. These reforms also specified that limited liability corporations had to register with the government and file balance sheets and shareholder lists with the Registrar of Companies.<sup>39</sup>

The impact of the innovation of limited liability joint stock **companies on textile industry finance was remarkable. In fact, the** sale of equity became the predominant form of corporate finance in cotton textile manufacturing. I have not been able to locate the Reports of the Bombay **Millowner's** Association for the years prior to 1900, but as of that year 142 of India's 163 active mills (87 percent) were joint stock limited liability corporations. The remaining<sup>21</sup> privately owned mills in operation tended to be smaller firms, accounting for but 11 percent of all spindles in **service.**<sup>40</sup> By 1930, 269 of the industry's 295 active mills (91 percent) were financed through the sale of equity. Only 26 of the active mills were **owned** by individuals or **partnerships.**<sup>41</sup>

Like the market for shares in the early New England cotton textile industry, the industrial securities market in India was rudimentary. Shares were closely held by a small number of **well-**to-do individuals, the par value of shares tended to be high (in the early years 5,000 rupees), discouraging small investors from

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<sup>39</sup>. The original reforms excluded banks and insurance companies. As of 1860, banks were also permitted to be formed under **limited** liability. Rungta, pp. 69-70.

<sup>40</sup>. Calculated from Report of the Bombay **Millowner's** Association, 1900.

<sup>41</sup>. Calculated from Report of the Bombay **Millowner's** Association, 1930.

owning them, and it was not until 1875 that a formal market with well defined rules developed in Bombay. The Ahmedabad stock exchange was not formally constituted until 1894, 'while the exchange in Calcutta was not constituted until 1908.<sup>42</sup> The evidence indicates, however, that over time smaller investors were becoming active in the market. By 1900, most shares carried a par value of 1,000 rupees, with newer issues often having much lower par values (sometimes as low as 50 rupees, more commonly 250 rupees), suggesting that they were attempting to capture the savings of smaller investors. Firms also began to issue preference shares, which paid a guaranteed rate of return (often seven or eight percent) to their holders.

What is particularly striking about the history of Indian cotton textile finance, is that virtually all of the capital was mobilized in India. According to the 1900 census conducted by the Bombay Mill Owner's Association, only three firms were capitalized in sterling in London. An additional two firms, both located in Pondicherry, were capitalized in francs in Paris. The rest of the industry, however, was capitalized in India and was run by Indian or Anglo-Indian firms.<sup>43</sup>

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<sup>42</sup>. Rungta, Rise of Business Corporations, p. 207; Gupta, Working of Stock Exchanges, p. 30.

<sup>43</sup>. Calculated from Report of the Bombay Millowner's Association, 1900. On the dominance of Indians in the textile industry see Rungta, chap. 12; Sen, **"Pattern of British Enterprise in India"**; Bagchi, **"European and Indian Entrepreneurship"**; Desai, **"Origins,"** pp. 103-104. Ray argues that English merchant houses were far more important in this process than is suggested by much of the literature. In order to make his case, however, he lists the firm of E.D. Sassoon and Company, the largest managing agency in the cotton textile industry, as a British enterprise. E.D. Sassoon and Company was nothing of the kind. The Sassoons were Sephardic Jews from **Bagdad** who emigrated to Bombay in the early nineteenth century and established themselves as important



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We should be careful, however, not to suggest that a smoothly running capital market existed in India by the turn of the century **or that all textile entrepreneurs had equal access to the** securities markets. In fact, quite the obverse was the case.

As a rule, Indian firms issued shares only to cover fixed assets. Working capital was obtained from short-term loans, which constituted a sizable percentage of **firms'** liabilities.<sup>44</sup> A calculation of the ratio of loan capital to paid-in capital plus reserves for 39 Bombay mills in 1894, for example, reveals a ratio of **.56:1.00.**<sup>45</sup>

India's banking system, however, was still quite rudimentary. As late as 1900 there were only nine Indian joint stock banks, plus eight exchange banks, and three presidency banks. The presidency banks were semi-governmental institutions, and the exchange banks, which financed international trade, were owned by foreigners. This **left the handful of joint stock banks, whose combined capital and deposits totalled** 93 million rupees.<sup>46</sup>

How then did India's textile mills obtain working capital? The answer to that question also explains why so many mills were financed through the sale of equity. Virtually all of India's cotton textile corporations were established by managing agencies, essentially large merchant houses. The managing agent both founded and promoted a mill, selling shares in the operation to his business associates and the investing public. The mill was then run

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merchants and bankers. See: Ray, Industrialization in India, pp. 32-33. On the Sassoons see: Roth, The Sassoon Dynasty; Jackson, The Sassoons.

<sup>44</sup>. Rungta, p. 235.

<sup>45</sup>. Calculated from data in Rungta, p. 291.

<sup>46</sup>. Rungta, p. 177.

by the agent under a long term contract (generally 20 to 30 years), with a fixed commission being paid for each yard of cloth or pound of yarn produced. Agents, for their part, were charged with running the mill and with securing working capital, which they obtained through their ties to the banking system and their networks in the merchant community. In fact, the largest managing agents also happened to be bank directors. Indeed, as Morris has noted, **"The credit worthiness of a managing agency was its major asset."**<sup>47</sup>

In this institutional set-up agents had an incentive to cheat. Since managing agents ran the mills, they could sell inputs to the mill from their own merchant houses and could market the mill's produce through their merchant houses, overcharging the mill in the first transaction and providing themselves with steep discounts in the second. There was little that shareholders could do about cheating, since the agent worked under long term contract. Not surprisingly, much of the literature on the managing agency system focuses on the inevitable swindles that occurred.<sup>48</sup>

The ability of a managing agent to cheat, however, was limited by the fact that a reputation as a swindler would make it difficult for him to promote additional enterprises or renegotiate contracts on existing enterprises when their initial term ran out.<sup>49</sup> Additionally, agents without reputations for honest dealing would be at a disadvantage when it came to borrowing funds from banks and

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47. Morris, "Indian Industry," p. 225.

48. See, for example, Rungta, p. 235.

49. A single managing agency ran a large number of enterprises across a broad range of activities. Since the length contracts and the starting point of contracts varied, agents renegotiated the terms of some of their contracts on a regular basis.

other merchants. As Morris has noted, **"there** is considerable evidence that an agent's prime concern was to preserve and strengthen his reputation even at the expense of short term **profits."**<sup>50</sup>

It is little wonder that a small group of managing agencies **controlled a surprisingly large number of mills.** In 1900, for example, the largest four agencies controlled 20 **mills.**<sup>51</sup> Not coincidentally, the largest of these agencies (controlling eight mills with over 240,000 spindles), the Anglo-Indian firm of Greaves, Cotton and Company, appears to have had a reputation for **accountability and honesty. Instead of working for a fixed** commission on output, this firm worked for a commission of 10 percent on net profits. It also was the first managing agency to introduce the practice of allowing for depreciation of physical assets, unlike other agencies which inflated profits (and therefore short-run returns to shareholders) by not deducting depreciation from income.<sup>52</sup> The other large, multi-mill agencies, such as E.D. Sassoon and Company (which controlled three mills in 1900), Currimbhoy Ebrahim, Sons and Company (which controlled four mills in 1900), the Dinshaw Manockjee Petit and Company (five mills in 1900), were all well established houses with long histories in Bombay.

In short, the managing agency system served much the same **function as did financial capitalists like Morgan and Rockefeller**

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<sup>50</sup>. Morris, "Indian Industry," p. 225.

<sup>51</sup>. **Calculated from Report of the Bombay Millowner's Association,** 1900.

<sup>52</sup>. Rungta, p. 160.

in the United States during the 1890's.<sup>53</sup> Investors were willing to invest in enterprises divorced from their control or experience because they knew that a financial capitalist with a well established reputation for being able to mobilize short-term capital was running the firm. The considerable payments made to Managing Agents, both in the form of direct commissions and indirect transfers, represent payments of economic rent in compensation for the agent's scarce talent, the ability **to mobilize** capital. As Lance Davis has shown, over time in the United States financial capitalists, by breaking down capital immobilities, outlived their usefulness. Such does not appear to have been the case in India, at least during the period under study here. The ability of powerful managing agents to trade their reputational capital for access to the savings of the investing community continued into the 1930s. In fact, by 1930 two of the country's most important managing agents, E.D. Sassoon and Company and Currimbhoy Ebrahim and Company, controlled 12 mills and 10 mills, respectively. More impressive still, these mills were spread across numerous presidencies: **Sassoon's** holdings included mills in Madras and the United Provinces of Agra and Oudh, in addition to its mills in Bombay; Currimbhoy **Ebrahim's** holdings included mills in Bombay, Hyderabad, Central India, and even **Ceylon**.<sup>54</sup>

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<sup>53</sup>. The difference was, of course, that the activities of Morgan and Rockefeller were focused on the creation of gigantic industrial conglomerates, like U.S. Steel, while the managing agency system existed to mobilize capital for the much smaller scale textile industry. In addition, financial capitalists in the United States outlived their usefulness quite early in the development process, but do not appear to have done so in India. See Davis, "Capital **Immobilities**."

<sup>54</sup>. Report of the Bombay Millowner's Association, 1930.

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## II. Finance and the structure and Growth of the Textile Industry

What effects did these differences in the development of capital have on the development of the textile industry in the countries under study? One would expect at least three. First, in countries where capital markets developed slowly and incompletely the textile industry should have grown more slowly. We should therefore expect to find Mexico's textile industry growing much more slowly than that of Brazil and India after their capital markets opened up. Second, privileged access to capital should have served as a barrier to entry: capital immobilities should have resulted in high levels of industrial concentration. Industry should have been most concentrated in Mexico and least concentrated in the United States, with India and Brazil falling between the **two**. Third, we would expect different trajectories of concentration. Concentration should have fallen fastest in Brazil, less quickly in India, and least of all in Mexico.

An examination of the data on the development of the textile industry in the four countries bears out these hypotheses. In regard to the rate of growth of the textile industry, the Brazilian and Indian textile industries, which had been virtually nonexistent in the first half of nineteenth century, quickly outgrew Mexico's after their capital markets opened up. To cite the case of Brazil, as late as 1882, the entire modern sector of the Brazilian cotton goods industry numbered only 41 firms running just over 70,000 spindles, less than one-third the size of Mexico's cotton goods industry (see Tables 1 and 2). This relative size relationship continued into the **mid-1890s**, but over the following ten years

widespread access to impersonal sources of capital in Brazil meant that its cotton textile industry was able to outgrow Mexico's by a factor of five, producing for the first time an absolute size difference in favor of Brazil. By the outbreak of World War I, Brazil's industry was roughly twice the size of Mexico's, a gap which grew to three to one by the onset of the Great Depression. The Indian cotton industry, which was roughly twice the size of Mexico's in terms of installed spindles in 1865, was close to six times the size of Mexico's circa 1900 and 11 times the size of Mexico's circa 1930 (see tables 1 and 3).

This is not to argue that access to capital was the only factor influencing the rate of growth of the textile industry in these three countries. There were numerous other constraints to the development of industry.<sup>55</sup> The data suggest, however, that problems of capital mobilization played an important role in the slow development of industry in all three countries during the nineteenth century. First, the fact that the textile industries in all three countries witness a spurt of growth after impersonal sources of finance became available indicates that their lack was a constraint prior to that. Second, the fact that Brazil's and India's textile manufacturing industries rapidly outgrew Mexican industry after their capital markets opened up certainly suggests an important role for impersonal sources of finance in a country's rate of industrial growth.

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55. For a discussion of these constraints in Mexico see Haber, Industry and Underdevelopment, chaps. 3-5; for a discussion of the Brazilian case see: Stein, Brazilian Cotton Textile Manufacture; Suzigan, Industria Brasileira; on India see Ray, Industrialization in India.

One might argue that capital immobilities had little to do with the rate of growth of the textile industry: Demand factors were far more important in influencing industry growth. Mexico's industry was smaller and grew less quickly than the those of India and Brazil because it had a smaller, poorer population. Comparing India to Brazil and Mexico in this regard is difficult, because of India's much larger population and the fact that India, unlike Brazil and Mexico, exported a significant portion of its textile output. But a comparison of Brazil and Mexico indicates that demand factors cannot explain differences in observed industry size. True, Brazil's population, which was roughly equal to that of Mexico in the early 1870s (9.9 million and 9.1 million, respectively) grew at almost twice Mexico's rate up to 1910 because of **Brazil's** policy of subsidizing European immigration. Mexican national income, however, outgrew Brazilian national income at a **similar rate during this same period. Circa 1877, Mexican national** income was only 55 percent that of Brazil. By 1910 it was within six percent of **Brazil's**. More importantly, Mexican income per capita outgrew that of Brazil by a factor of 10. In 1877, Mexican per capita income was 75 percent that of Brazil. By 1910 Mexican per capita income was 40 percent higher than **Brazil's**.<sup>56</sup> Given that the income elasticity of demand for textiles was very high, Mexico likely had a much higher per capita demand for textile products than the differences in per capita income would

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<sup>56</sup>. National income data from Coatsworth, "Obstacles," p. 82. Population data from Instituto **Nacional** de Estadística, Geografía, e **Informática, Estadísticas**, p. 9; Instituto Brasileiro de Geografia e Estatística, Estatísticas, p. 33.

indicate.<sup>57</sup> In short, it is hard to reconcile a demand side story with Brazil's lower absolute levels of per capita income and lower rates of growth of both per capita and national income.<sup>58</sup>

As for the effects of capital immobilities on industrial concentration, the data are unequivocal: access to capital had a significant effect on the level of concentration. Tables 1-4 and Graphs 1 and 2 present estimates of four-firm concentration ratios (the percent of the market controlled by the four largest firms) for all four countries and Herfindahl indices (the sum of the squares of the market shares of all firms in an industry) for Mexico and Brazil, with a few observations available for India as well.<sup>59</sup> There are a number of striking features of the data.

The first is the low, and continually declining, level of concentration in the United States. As table 4 indicates, the

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<sup>57</sup>. Contemporary observers noted this high income elasticity of demand for textile products. Their observations can be found in Haber, Industry and Underdevelopment, pp. 28-29.

<sup>58</sup>. Accounting for imports would not overturn these results. Both countries were highly protectionist, with tariffs often equal to 300 percent of the value of goods abroad. Imports by 1910 therefore accounted for only 20 of consumption. This was almost entirely high value, fine weave goods.

<sup>59</sup>. These estimates of concentration are all calculated at the firm level. For the U.S., Mexican, and Brazilian data, this involved combining the market shares of all mills held by a single corporation, partnership, or sole proprietor. For India, this involved combining the market shares of all mills held by a single sole proprietor, partnership, or managing agent. Market shares for Mexico and Brazil were calculated from estimates of the actual sales or value of output of mills. Market shares for India and the United States had to be estimated from information on installed spindles. Econometric work on the United States indicates that there was a 25 percent difference in output per spindle between average and best practice techniques. I therefore assumed that the largest firms in India and the United States were 25 percent more productive than the average, and adjusted their market shares upwards accordingly. Ongoing work on India will estimate Herfindahl indices for 1900-1940. On average and best practice techniques see Davis and Stettler, "The New England Textile Industry," p. 231.



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average four-firm ratio during the period 1850-1930 was .089. The trend over time was for concentration to decline at .5 percent per year. From 1860 to 1920, the four-firm ratio dropped from .126 to .066. The Great Depression temporarily reversed the trend, the result of several merger attempts designed to bring the industry's excess capacity under control and end a period of cutthroat competition. Within a few years, however, most of those mergers had failed. Post-1930 evidence indicates that concentration had returned to its 1920 level by 1937.<sup>60</sup> This is precisely the kind of pattern that would be expected in a rapidly growing industry characterized by constant returns to scale technology and insignificant barriers to entry.

The second striking feature of the data is the persistently high level of concentration in India. From the limited data available at present, the four-firm ratio in India was persistently in the .19 range from 1900 to 1930 (see Table 3). This is particularly remarkable considering the absolute size of the Indian textile industry. By the second decade of the twentieth century, India's industry was roughly three times the size of Brazil's, yet they displayed similar four firm concentration ratios and Herfindahl indices. By 1930, the size difference was even more pronounced, but India's four-firm ratios were roughly 20 percent higher than those prevailing in Brazil (see Tables 1 and 3).

The third is that the opening of Mexico's capital markets actually produced an increase in concentration. The trend in

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60. Temporary National Economic Committee, Investigation of Concentration, pp. 253-254; Reynolds, "Cut Throat Competition," pp. 740-42; Kennedy, Profits and Losses, chaps. 2-6; Wright, "Cheap Labor," p. 106.

Mexico from the 1850s to the late 1880s was a gradual decrease in concentration: exactly the trend that one would expect in an expanding industry characterized by constant returns to scale technology. As Table 2 and Graphs 1 and 2 indicate, Mexico's **four-firm ratio** fell from a high of **.449** in 1850 to a low of **.160** in 1878, while the Herfindahl dropped from a **.0686** to **.0249** over the same period. Beginning in the mid to late **1880s**, the trend **reversed, even** though the industry was witnessing rapid growth. **By** 1902, both the four-firm ratio and the Herfindahl had nearly regained their 1853 levels, standing at **.381** and **.0637** respectively. Concentration then began to decrease again to 1912, when the Revolution interceded and again reversed the trend.

The final striking feature of the data is that it indicates that the more profound opening of Brazil's capital markets produced exactly the opposite result than that obtained in Mexico (see Table 1 and Graphs 1 and 2). The sharp drop in concentration from 1866 to 1882 is clearly a mathematical identity, having to do with the small size of the industry in 1866 when there were only nine firms. What is **more** relevant for our purposes is that this rapid rate of decrease in concentration took off again during the years from 1895 to 1907, and then slowed only slightly to 1915, when it began to gently level off. By 1915, the estimated Herfindahl index for Brazil stood at approximately one-quarter of its 1882 **value.**<sup>61</sup>

Compared to Mexico, Brazil's textile industry was surprisingly

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<sup>61</sup>. One might argue that these differences in concentration would disappear if imports of foreign textiles were accounted for, but that argument does not stand up to the empirical evidence on textile imports. Indeed, both Brazil and Mexico followed highly protectionist policies after 1890, virtually eliminating imported cloth except for fine weave, high value goods.

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unconcentrated, and became increasingly less so over time. Prior to the **1890s**, Brazil's relatively small textile industry displayed higher levels of concentration than **Mexico's**. By **1905**, however, relatively widespread access to institutional sources of capital in Brazil drove concentration down to roughly 60 percent of that in Mexico. Just prior to the onset of the Great Depression, the level of concentration in Brazil was only 58 percent of that in Mexico measured by the four-firm ratio and only 42 percent of that in Mexico measured by the Herfindahl index.

One might argue that Mexico's higher concentration ratios had **little to do with capital immobilities: high levels of** concentration were produced by demand, not supply factors. Mexico had higher levels of concentration and a different trajectory of concentration because it had a smaller textile industry than Brazil, India, or the United States. There are three problems with<sup>3</sup> this line of argument.

The first is that this interpretation is not consistent with the data on Brazil and India. Given the tremendous differences in industry size between them, India should have had much lower levels of concentration than Brazil. Yet exactly the opposite is observed.

The second is that Mexico's industry leaders were tremendous operations in an absolute sense. Mexico's leading firms were not simply large relative to the small Mexican market, they were **enormous operations, even by U.S. and Indian standards**. Mexico's largest firm in 1912, for example, the **Compañía** Industrial de Orizaba (CIDOSA), was a four-mill operation employing 4,284 workers running 92,708 spindles and 3,899 looms. Had it been located in the

United States, it would have ranked among the 25 largest cotton textile enterprises. Had it been located in India it would have been among the top 12 textile enterprises. Significantly, in the country with the market size closest to that of Mexico, Brazil, the largest firm was actually smaller than CIDOSA. Brazil's largest **producer, the Companhia America Fabril, controlled 6 mills in 1915,** employing 3,100 workers running 85,286 spindles and 2,170 looms.

The third problem with this hypothesis is that it cannot explain why Mexican concentration increased during a period when the industry was experiencing rapid growth, the years 1878-1902. Without some supply factor intervening during this period, Mexican concentration should have continued to decline, instead of **jumping** back up to its 1850 level.

In order to test this hypothesis in a formal manner, I estimated a simple OLS regression that measures the elasticity of **concentration with respect to industry size. The logic behind the** estimation is the following: in an industry characterized by modest returns to scale, with no significant technological changes that would raise the minimum efficient scale of production in a discontinuous way, we should be able to predict the level of concentration simply by knowing the size of the industry. Similar regression results for Brazil and Mexico would indicate that concentration was simply a function of industry size. If, however, **similar specifications of the regression for each country yield** different results, then some intervening variable (like an imperfection in a factor market) must have been at **work.**<sup>62</sup>

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<sup>62</sup>. Brazil and Mexico are because their industries developed at roughly similar times and utilized similar technologies. The

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Table 5 presents various regression specifications. All values are converted to natural logs in order to capture how changes in the size of the industry effect the change in concentration. Concentration is measured as the Herfindahl Index.

The first specification of the regression measures industry size as simply the number of active firms. For Brazil we obtain fairly unambiguous results: the parameter estimate for  $(\ln)\text{firms}$  is  $-.73$  with an  $R^2$  of  $.98$ . That is, the elasticity of concentration with respect to size is  $.76$  (as industry size doubles concentration decreases by 76 percent). Ninety eight percent of the movement in concentration is explained by change in industry size. For Mexico, however, the results are much less robust: the parameter estimate for  $(\ln)\text{firms}$  is significantly lower ( $-.44$ ) and the  $R^2$  is only  $.17$ . In short, the results indicate that in Brazil we can predict concentration from industry size with a great deal of certainty, but in Mexico we cannot (see Table 5).

Perhaps it is the case that the number of firms is a poor proxy for industry size. The second specification of the regressions therefore substitutes the natural log of the number of

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model makes the reasonable assumption that there were no discontinuous jumps in minimum efficient scales in either country, though it does allow for a gradual increase in minimum efficient scales. For this reason, it is unlikely that the elasticities of the size variables will sum to unity. Observations by contemporaries indicate that there were no discontinuous jumps in textile manufacturing technology during the period that affected the Brazilian or Mexican industries. The only major innovation was the Northrup automatic loom, which was developed in the 1890s. But the Northrup loom was not widely adopted in either country (there were only 25 of them in service in Mexico as late as 1910). Moreover, to the extent that there were **technological** jumps, these would be more pronounced in the Brazilian regressions than in those for Mexico, because of Brazil's faster purchase of new capacity. This would tend to bias the results against the hypothesis advanced here.

active spindles as the independent variable. This specification again yields robust results for Brazil, but again fails to serve as a meaningful predictor of concentration in Mexico.- For Brazil the parameter estimate on  $(\ln)\text{spindles}$  is  $-.38$  with an  $R^2$  of  $.71$ . For Mexico, the parameter estimate is only  $-.09$  and  $R^2$  is only  $.04$ , indicating no correlation between the two variables.

The third specification of the regression assumes that spindles and firms are not collinear and includes both size measures on the right hand side of the equation. For Brazil we again get an extraordinarily good fit. The parameter estimate is  $-.02$  for  $(\ln)\text{spindles}$  and  $-.70$  for  $(\ln)\text{firms}$ .  $R^2$  is  $.98$ . Since the combined elasticities are actually lower than for  $(\ln)\text{firms}$  alone, it appears that firms and spindles are collinear. This makes perfect sense in an industry characterized by modest returns to scale and low barriers to entry. As the industry grows, the number of firms does as well.

The Mexican results, however, again indicate that concentration cannot be explained by industry size. While the third specification of the regression yields a high parameter estimate of  $-1.28$  for  $(\ln)\text{firms}$ , the parameter estimate for  $(\ln)\text{spindles}$  points the wrong way ( $.50$ ). Most of the variance around the mean cannot be explained by the regression:  $R^2$  is only  $.38$ , though it is significant that  $R^2$  more than doubles if both variables are included. What is particularly striking is that this specification indicates that  $(\ln)\text{spindles}$  and  $(\ln)\text{firms}$  were not collinear in Mexico, as they were in Brazil, suggesting that in

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Mexico an industry that a priori should be characterized by modest or constant returns to scale was behaving like an industry **characterized by sizable increasing returns to scale.**

In short, all three specifications of the regressions indicate that concentration in Brazil was a function of industry size, but in Mexico it was not. A glance at Tables 1 and 2 and Graphs 1 and 2 quickly indicate why it was not: in many years in post-1890 Mexico concentration actually increased as industry size grew. Some other intervening variable influenced concentration in Mexico.

What would Mexican industry have looked like, in terms of its structure, had this other intervening variable not been operating? Assuming that in the absence of this intervening variable the same relationship between industry size and industry structure would have held **for both Brazil and Mexico**, estimating Mexico's predicted level of concentration is a straightforward operation. It simply **entails estimating a predicted Hcrfindahl series using the** Brazilian coefficients from the first regression (**see Table 5,** above) and the actual Mexican data on numbers of firms and **spindles.**<sup>63</sup>

Table 6 and Graph 3 present these predicted Herfindahl values for Mexico, as well as **the actual Mexican and Brazilian series.** There are two features about the predicted series that are notable. The first is that until the early **1890's** the fitted series does a

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63. This is an upper bound prediction. The model assumes that Mexico's industry size would have been the same in the presence of **a better developed capital market, which is highly unlikely.** Had the size of the industry been larger, the predicted concentration ratios would be even lower than those estimated here. The first **specification of the regression was** used because it provided the best fit for both the Mexican and Brazilian data.

reasonably good job of predicting the movement of concentration in Mexico, indicating that the statistical relationship between industry size and concentration observed in Brazil- held in Mexico as well until its capital markets opened up. The second is that after 1893 Mexico's actual and predicted Herfindahl values moved in entirely different directions. By 1902, the actual level of concentration in Mexico was more than twice its predicted value.

What mechanisms were at work causing Mexico's level of industrial concentration to increase during a period of rapid expansion? Why did the trajectory of concentration in Mexico reverse in the 1890's, and why did it resume its fall after 1902?

The answer to these questions basically turns on the effects of the limited opening of Mexico's capital markets. In the years after 1889 Mexico's big, multi-plant, industry leaders (the **Compañía** Industrial de Orizaba, **Compañía** Industrial Veracruzana, **Compañía** Industrial de Atlixco, and **Compaiila** Industrial de San Antonio **Abad**) were founded with capital provided by the Mexico City stock exchange. These firms were able to purchase newer, more efficient equipment faster than their smaller competitors who did not have recourse to the sale of equity. They therefore had both a size advantage (meaning they could threaten to lower prices) and a productivity advantage (the large, new firms were 31 percent more productive than their smaller competitors--see Table 7). The result was increasing levels of concentration.

Why then did concentration drop in the years from 1902 to 1912? Why did the industry leaders not continue to exercise market dominance? The answer is that after they achieved control of the



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market, Mexico's industry leaders dramatically slowed their rate of new investment. A comparison of the 1895 and 1912 cross sections indicates that firms that **had access to the capital market did not** purchase new machinery at a faster rate than did non-capital market firms. In fact, a comparison of firms extant in both censuses indicates that, if anything, firms that did not have **access** to impersonal sources of capital purchased new machinery at a faster rate than firms that had access to the capital market.- Under a set of assumptions that minimizes the replacement of old equipment by new equipment (thereby biasing downward the total addition of new machinery), the non-capital market firms purchased new looms at a rate roughly equal to that of the capital market firms and purchased new spindles at a rate more than 50 percent faster. Under a set of assumptions that maximizes the replacement of old machinery by new machinery (thereby biasing upwards the total addition of new machinery), **the non-capital market firms purchased new** looms at a 13 percent faster rate than capital market firms and new spindles at a 35 percent faster rate.

These results are consistent with estimates I have made of total factor productivity differentials in the 1895 and 1912 census years. As table 7 demonstrates, in 1895 non-capital market firms were significantly less productive than capital market firms (1,360 pesos in sales per input of capital and labor, versus 1,776 pesos per input of capital and labor, a difference of roughly 31

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64. The method employed was to include in the sample all firms that appeared in both censuses, as well as firms that were founded after 1895 but that purchased factories that were extant in the 1895 census. Firms were not included if they went out of business and permanently closed their factories after 1895, or if they were founded after 1895 and built entirely new factories.

percent). By 1912, however, these differences had decreased substantially. Sales per input of labor and capital stood at 1,686 pesos for non-capital market firms and at 1,824 pesos for capital market firms, a difference of only eight percent.

In short, the data indicate that the handful of firms that were able to mobilize capital through institutional sources gained a one-time advantage over their competitors. They then sat back and watched their rents dissipate as their smaller competitors gradually closed the productivity differential through the reinvestment of retained earnings. Why they pursued this strategy is somewhat of a mystery at this point. It may have been that their managers perceived (incorrectly) that their ability to mobilize institutional sources of capital would have served as a disincentive to new entrants. Potential new entrants would, according to this rationale, have seen that the industry leaders could rapidly install excess capacity, thereby increasing production and lowering prices below the potential entrant's long run average cost curve. It might also have been that the rates of return available from the big, multi-plant mills were disappointing to the investment community. New infusions of equity capital may therefore have dried up after 1902. Or it may have been that stockholders did not trust the management of the enterprises or were operating with a short time horizon. They therefore demanded that all profits be paid out as dividends.

Whatever the source of this peculiar behavior by the industry leaders, the lack of new investment on their part, coupled with the relatively slow rate of growth of new investment implied by the

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need to finance new plant and equipment purchases out of retained earnings by their competitors, suggests that the overall rate of growth of productivity in Mexico must have been low relative to Brazil, India, and the United States. Work in progress hopes to shed light on this issue.

### III. Conclusions

What lessons are there to be drawn from this story about government regulation, capital market development, and the growth and structure of industry?

The first is that government regulatory policies had a significant effect on the growth of capital markets. Capital market development in the four countries studied here was not completely endogenous to the process of economic growth: different histories of government regulation in each of the cases gave rise to very different sizes and structures of capital markets.

Second, capital immobilities appear to have been in large part the product of the inability of investors to obtain information and monitor managers. In Mexico, information was difficult to obtain. In India, information was more freely available, but it was nearly impossible for investors to affect the behavior of managers. This gave well known financiers with established reputations privileged access to the capital markets. This was a very different outcome than that which obtained in Brazil, where the costs of information appear to have been much lower.

Third, differences in capital market development had a significant impact on the rate of growth of industry. Mexico's financial system, in which a small group of entrepreneurs could get

access to impersonal sources of capital while most entrepreneurs could not, gave rise to a small textile industry relative to Brazil. **The rapid expansion of the Brazilian textile industry after** the opening up of the capital markets in the late **1880's** underlines the important role played by access to finance in industrial growth. In sum, lack of access to institutional sources of capital because of poorly developed capital markets was a non-negligible obstacle to industrial development in the nineteenth century.

Fourth, imperfections in capital markets also had a significant effect on the structure of industry. The much more limited opening of the capital markets in India and Mexico gave rise to higher levels of concentration than in Brazil and the United States. Analysis of the data indicates that these differences existed independent of industry size.

Fifth, the data analyzed to date suggest that Mexico's **peculiarly uncompetitive structure of industry may have created** disincentives to new investment by its industry leaders. In addition, the need to rely on retained earnings to finance most new investment would suggest that in general **Mexico's** rate of growth of investment was much slower than in countries, such as Brazil and India, that had more open capital markets. The result may well have been much slower rates of growth of output and productivity in the Mexican case, meaning that Mexican industry may have become increasingly less competitive over time. Work in progress hopes to shed light on this issue.

Table One

## Size and Structure of the Brazilian Cotton Textile Industry

Year	Active Firms	Firms With Useful Data	Active Spindles	Four Firm Ratio*	Herfindahl Index*
1866	9	9	14,875	.766	.1773
1882	41	30	70,188	.376	.0631
1883	44	33	65,937	.371	.0582
1895	43	27	169,451	.349	.0585
1905	98	80	734,928	.207	.0279
1907	117	115		.203	.0250
1915	180	168	1,492,822	.161	.0165
1927	273	231	2,634,293	.162	.0141
1934	266	247	2,700,228	.173	.0168

\* Concentration measured at the firm level. See footnote 59.

Source: Borja Castro, "Relatorio do Segundo grupo," pp. 3-73; Commissao de Inquerito Industrial, Relatorio ao Ministerio da Fazenda; Ministerio da Industria, Viaçao e Obras Publicas, Relatorio. 1895; Vasco, "A industria do algodao"; Centro Industrial do Brasil, O Brasil; Centro Industrial do Brasil, O Centro Industrial; Centro Industrial de Fiacao e Tecelagem de Algodao, Estatisticas da indbstria; and Stein, Brazilian Cotton Textile Manufacture, appendix 1.

Table Two  
Size and Structure of the Mexican  
Cotton Textile Industry, 1843-1929

Year	Firms Listed	Firms With Useful Data	Active Spindles	Four Firm Ratio*	Mexico Herfindahl Index*
1843	52	51	95,208	0.376	0.0524
1850	51	51	135,538	0.449	0.0686
1853	36	36	121,714	0.430	0.0677
1862	40	40	129,991	0.319	0.0490
1865	52	52	151,722	0.342	0.0501
1878	81	81	249,294	0.160	0.0209
1883	83	83		0.189	0.0225
1888	110	91	249,561	0.217	0.0249
1891	80	78		0.228	0.0268
1893	89	83	351,568	0.284	0.0355
1895	85	85	411,090	0.363	0.0480
1896	97	83	397,767	0.371	0.0513
1902	109	109	595,728	0.381	0.0637
1906	106	106	688,217	0.338	0.0486
1912	100	100	749,949	0.271	0.0343
1919	88	88	735,308	0.374	0.0592
1929	123	123	839,109	0.278	0.0335

\* Concentration measured at the firm level. See footnote 59.

Sources: Secretaria de Hacienda y Crédito Público, Documentos, p. 81; Ministerio de Fomento, Estadística del Departamento, table 2; Ministerio de Fomento, Memoria (1857), docs. 18-1, 18-2; Dirección de Colonización e Industria, Memoria (1850); Pérez Hernández, Estadística; Ministerio de Fomento, Memoria (1865), pp. 438-40; Secretaría de Fomento, Boletín Semestral de la República Mexicana, 1889; Secretaría de Fomento, Anuario Estadístico de la República Mexicana, 1893; Secretaría de Fomento, Anuario Estadístico de la República Mexicana, 1895; Secretaría de Hacienda, Memoria, 1895; Archivo General de la Nación, Ramo de Trabajo, caja 5, legajo 4; Secretaría de Hacienda, Boletín, second semester 1919, first semester 1920, Jan. 1930; La Semana Mercantil, June 23, 1902 and June 25, 1906; Haber, Industry and Underdevelopment, pp. 125, 158.

Table 3

## Size and Structure of the Indian Cotton Textile Industry

Year	Mills	Spindles	Four Firm Ratio*	Herfindahl Index*
1865	13	285,524		
<b>1875</b>	<b>36</b>	<b>886,098</b>		
1885	87	2,145,646		
1900	193	4,945,783	. 190	. 0178
1911	<b>261</b>	<b>6,357,460</b>	<b>. 190</b>	<b>. 0181</b>
1920	253	6,763,036	. 206	
1930	348	9,124,768	<b>.189</b>	

\* Concentration measured at the firm level. See footnote 59.

Source: Estimated from Report of the Bombay Millowners Association, 1900, 1911, 1920, 1930.

Table Four  
Size and Structure of the U.S. Cotton Textile Industry

Year	Active Mills	Spindles	Four Firm Ratio*
1850	1,094		.100
1860	1,091		.126
1870	956		.107
1880	756	10,653,435	.087
1890	905	14,384,180	.077
1900	1,055	19,463,984	.072
1910	1,324	28,178,862	.075
1920	1,496	34,603,471	.066
1930	1,281	33,009,323	.095

\* Concentration measured at the firm level. See footnote 59.

Sources: Calculated from U.S. Bureau of the Census, Census of Manufactures, 1849-1929; **Bateman** and Weiss Large Firm Sample for 1840-1860; Davison's Blue Book; Official American Textile Directory; The Textile Manufacturer's Directory; and Dockham's American Report.



Table Five

Alternate Specifications of Industrial Concentration  
Regressions

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Mexico (1843-1929) and Brazil (1866-1934)

Dependent Variable: **(ln)Herfindahl** Index  
T statistics in parentheses

	Mexico			Brazil		
	Spec. 1	Spec. 2	Spec. 3	Spec. 1	Spec. 2	Spec. 3
Intercept	-1.28	-1.92	-3.83	-.29	1.65	-.11
(ln) firms	-.44 (-1.73)		-1.29 (-2.58)	-.73 (-18.41)		-.70 (-8.38)
(ln) spindles		-.09 (-0.74)	.50 (1.97)		-.38 (-3.79)	-.02 (-.47)
R <sup>2</sup>	.17	.04	.38	.98	.71	.98
N	17	15	15	9	8	8

Source: See tables 1 and 2.

Table Six

Actual and Predicted Herfindahl Indices,  
Mexico and Brazil 1843-1934

	ACTUAL MEXICO	PREDICTED MEXICO	ACTUAL BRAZIL
1843	.0524	.0431	
1850	.0686	.0431	
1853	.0677	.0555	
1862	.0490	.0514	
1865	.0501	.0425	
1866			.1773
1878	.0209	.0308	
1882			.0631
1883	.0225	.0303	.0582
1888	.0249	.0317	
1891	.0268		
1893	.0355	.0207	
1895	.0480	.0303	.0585
1896	.0513		
1902	.0637	.0248	
1905			.0279
1906	.0486	.0253	
1907			.0250
1912	.0343	.0264	
1915			.0170
1919	.0592	.0290	
1927			.0141
1929	.0335	.0227	
1934			.0168

SOURCE: Actual data from tables 1 and 2. Predicted Mexico series uses the parameter estimates for Brazil from specification one in table 5 and the actual Mexican data on number of firms with **usefulb** data. It predicts Mexico's level of concentration had the same relationship held between industry size and industry structure as in Brazil.

Table Seven  
 Estimates of Total Factor Productivity By Firm Type  
 Mexico 1895 and 1912  
 (Current Pesos)

	Mexico 1895	Mexico 1912
Capital Market Firms	1,776	1,824
Non-Capital Market Firms	1,360	1,686
Differential	31%	8%

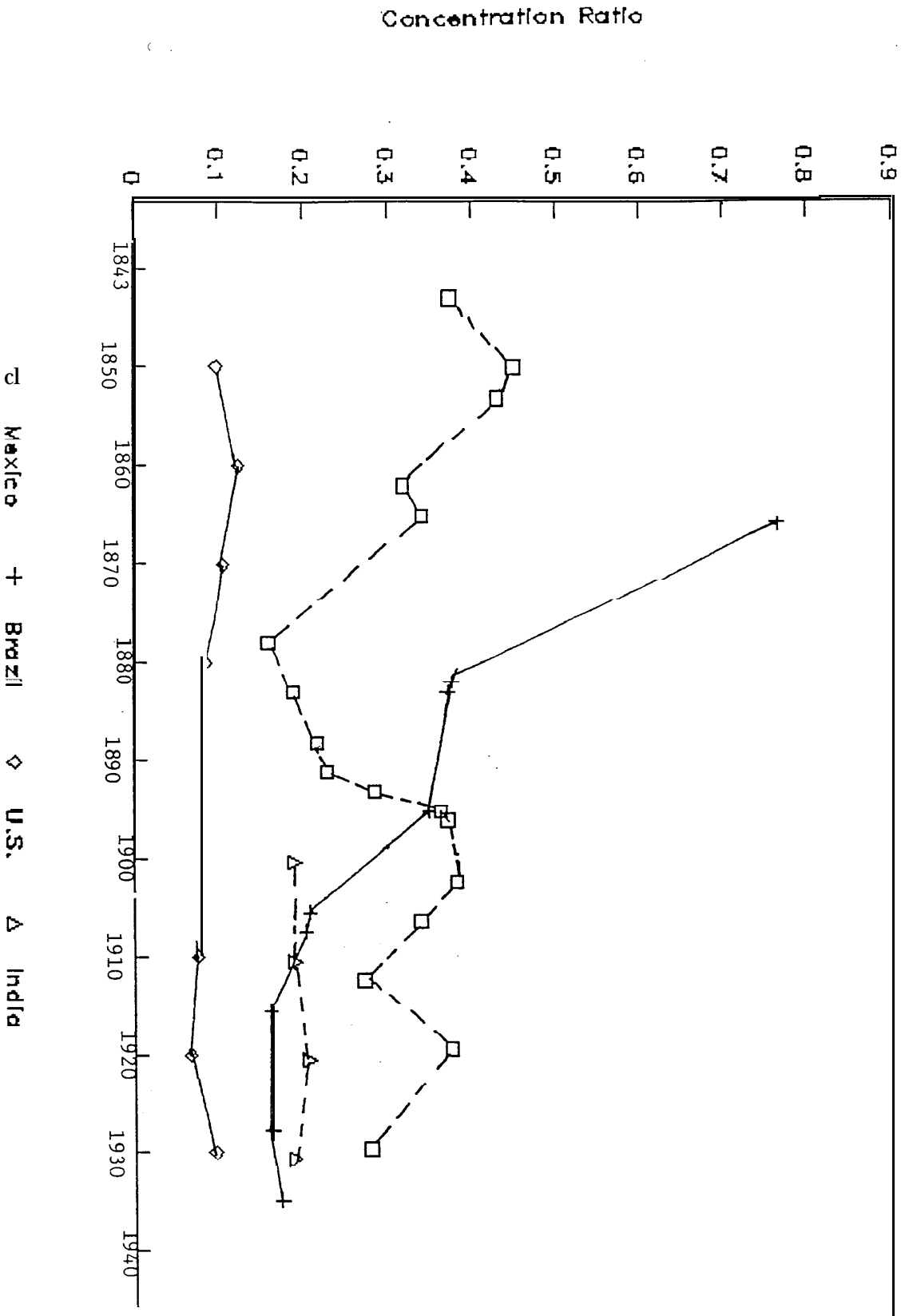
Sources: **Archivo** General de la Nación, caja 5, legajo 4; Secretaria de Fomento, Anuario Estadístico de la República Mexicana, 1895.

Weights for estimating factor productivity are from Cobb-Douglas production functions for each cross section. Results are not comparable from year to year, but are meant solely to capture the productivity differentials between capital market and non-capital market firms within each cross section. The production functions were specified as  $Q=f(k,l)$ , where  $Q$  = the natural log of the value of output,  $k$  = the natural log of capital **measured as looms, and**  $l$  = the natural log of labor measured as workers. This produced elasticities of **.548** for capital and **.510** for labor in 1895 ( $T$  was 4.72 and 4.30, **respectively,** and  $R^2$  was **.85**), and **.096** for capital and **.875** for labor in 1912 ( $T$  was **.54** and 4.68 respectively, and  $R^2$  was **.72**). The elasticities of  $k$  and  $l$  were normalized to 1 in **order to estimate TFP.** Note that production functions imply modest returns to scale in 1895 (6%) but slightly negative returns to scale (-3%) in 1912.

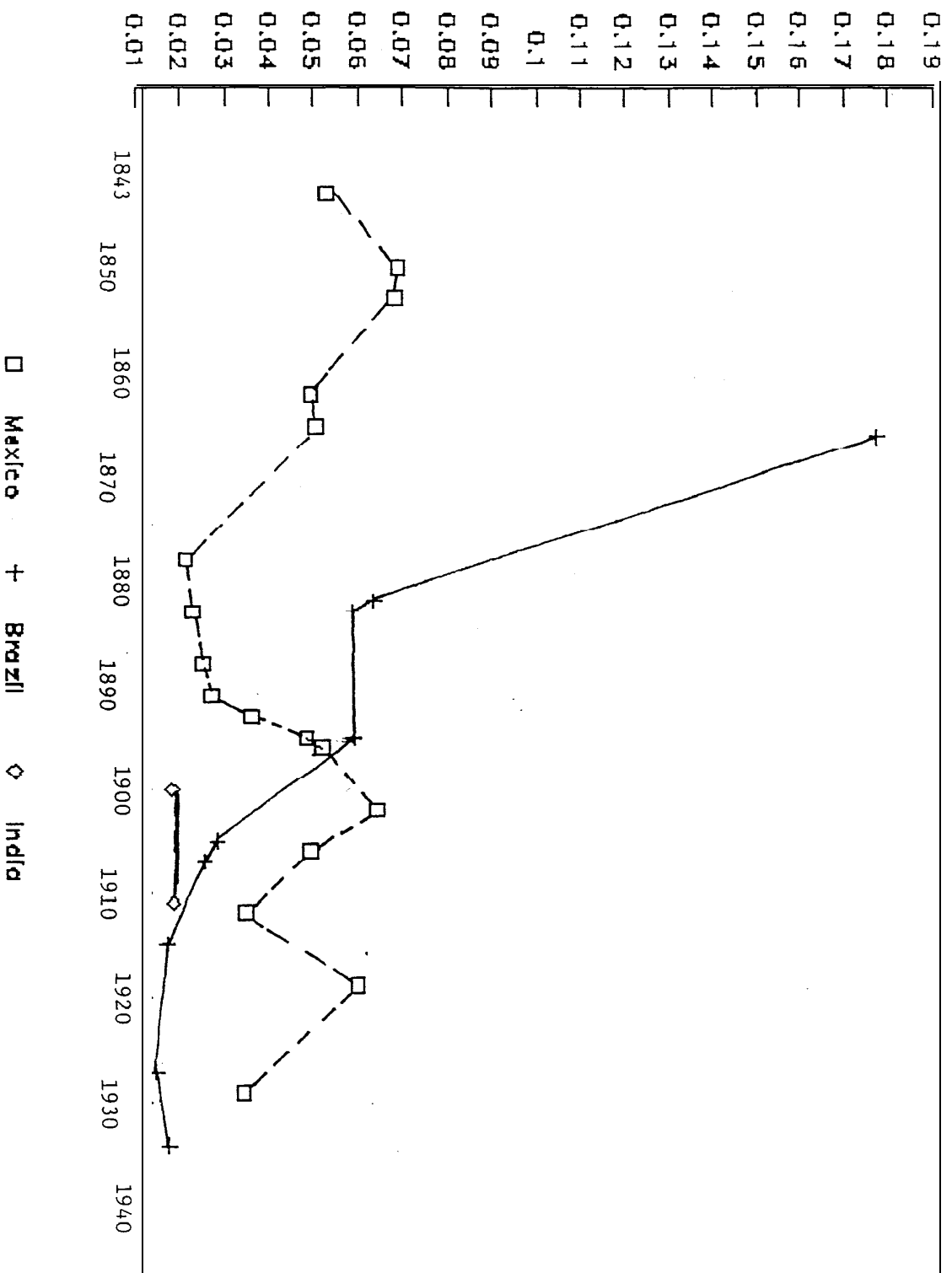
Sources: See table 2.

GRAPH ONE

# Four Firm Concentration Ratios

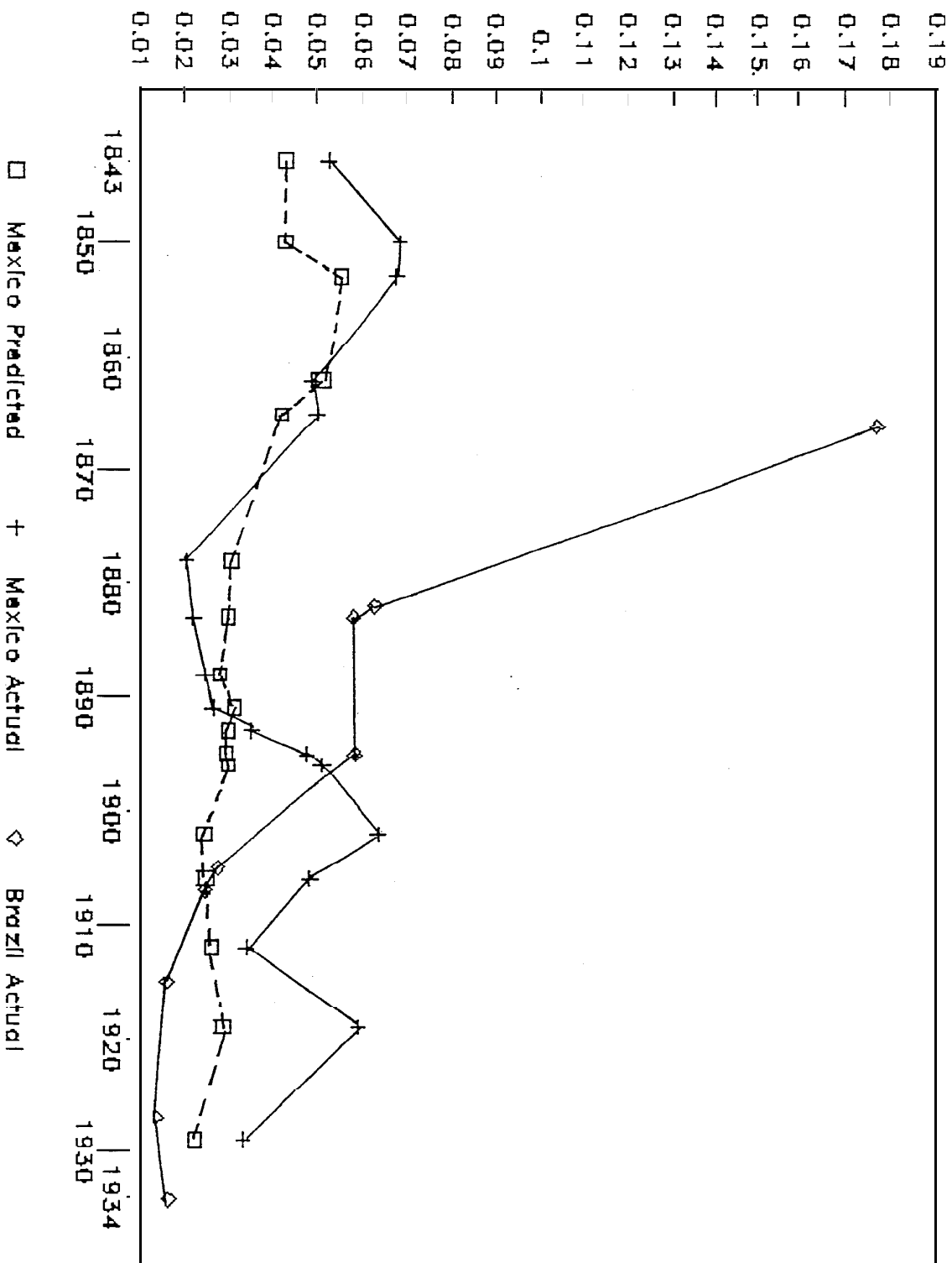


GRAPH TWO  
Herfindahl Indices



GRAPH THREE

# Herfindahl Indices, Actual & Predicted



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